

PATENT ABSTRACTS OF JAPAN

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(54) FLAT BATTERY

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent a lead terminal from being cut by a movement of an unit cell due to impact and vibration by improving a lead terminal having its tip extracted outside a case, in a flat battery having a laminated sheet mainly of a resin film for an armored case.

SOLUTION: An almost S-shaped bent part comprising a first folded part folded back toward the base of a terminal part in connection with a welded part and a second folded part folded back again in the extracting direction of a lead in the vicinity of the base of the terminal part is provided at a lead terminal with each end welded to the positive and negative electrode terminals of an unit cell 4 formed by integrally laminating the positive electrode 1, a separator 3 and the negative electrode 2, and the lead terminal is prevented from being cut by absorbing and eliminating a stress caused by a movement

of the unit due to the bending and stretching deformation of the almost S-shaped bent part.

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CLAIMS  
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[Claim(s)]

[Claim 1] The flat unit cell which carried out the laminating unification of the separator and negative electrode which consist of a polymer which holds the positive electrode of the shape of the shape of a film, and a sheet, and an electrolyte, respectively, It is the cell which consists of a sheathing case which consisted of a resin film subject's lamination sheets, and sealed said unit cell inside. The positive electrode and negative electrode of each unit cell An end is welded to each terminal area and it has the lead terminal with which the other end was pulled out out of the sheathing case, respectively.

This lead terminal is a flat cell with the letter bending section of the abbreviation for S characters which stood in a row at the welded end, and was turned up in the direction of the root of said terminal area, and was again turned up in the direction of a drawer of a lead near the root.

[Claim 2] A lead terminal is a flat cell with the letter bending section of the abbreviation for S characters which an end is welded to the first page side of any upper and lower sides of the terminal area of a positive electrode and each negative electrode, stands in a row at this end, crosses said terminal area end face, and consists of the 2nd bending section again turned up in the direction of a drawer of a lead near the terminal area the 1st bending section turned up in the direction of the terminal area root from the side on the other hand, and near the terminal area root according to claim 1.

[Claim 3] A lead terminal is a flat cell with the 1st bending section which the end was welded to the first page side of any upper and lower sides of the terminal area of a positive electrode and each negative electrode, and was turned up in the direction of the terminal area root near the tip of a terminal area, and the letter bending section of the abbreviation for S characters which consists of the 2nd bending section again turned up in the direction of a drawer of a lead near the terminal area root according to claim 1.

[Claim 4] A lead terminal is a flat cell according to claim 1 to 3 by which it is formed with the charge collector and this quality of the material which constitute the terminal area of a positive electrode and each negative electrode, and the thickness is prepared more thickly than that of said terminal area.

[Claim 5] The flat unit cell which carried out the laminating unification of the separator and negative electrode which consist of a polymer which holds the positive electrode of the shape of the shape of a film, and a sheet, and an electrolyte, respectively The number pile \*\*\*\*\* of arbitration, The positive electrode and negative electrode of each unit cell which consist of a resin film subject's lamination sheets, are the cell which consists of a sheathing case which sealed said cell group inside, and constitute a cell group An end is welded to the part which each terminal area piled up with the same polarities. The 1st bending section which the other end was equipped with the lead terminal pulled out out of the sheathing case, respectively, and this lead terminal stood in a row at the welded end, and was turned up in the direction of the root of a terminal area near the tip of said terminal area, The flat cell which has the letter bending section of the abbreviation for S characters which consists of the 2nd bending section turned up again in the direction of a drawer of a lead near the terminal area root.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates flat unit cells which carried out the laminating unification of the positive electrode of the shape of the shape of a film, and a sheet, a separator, and the negative electrode, such as a flat cell, especially a polymer electrolyte cell, or this unit cell in the number pile \*\*\*\*\* of arbitration to amelioration of the lead terminal which is an in-and-out force terminal of the cell held in the sheathing case.

[0002]

[Description of the Prior Art] The positive electrode and negative electrode of the shape of the shape of a film which applied and obtained the paste-like active material to the flat cell, especially the porous charge collector, and a sheet, The flat unit cell which carried out the laminating unification of the porous film-like separator which consists of a polymer holding the electrolyte arranged among these two poles The cell held in the sheathing case which consisted of a resin film subject's lamination sheets is thin in thickness, and the degree of freedom of a configuration is far higher than the cell using a can-like container.

[0003] By this cell, the other end of the lead terminal made from sheet metal with which the end was welded to the terminal area of a positive electrode and a negative electrode, respectively is pulled out out of a sheathing case from the relation which uses a resin film subject's letter sheathing case of lamination sheet bag manufacture, and it is considering as the in-and-out force terminal. In this case, although based also on the configuration of a unit cell, since, as for a principal plane part parallel to the reaction side of the unified unit cell, the inside of a sheathing case is located along with this, migration within a sheathing case is controlled.

[0004]

[Problem(s) to be Solved by the Invention] However, the amount of [ with the edge surface part of the perimeter of a unit cell, especially the terminal area to which the lead terminal was connected ] edge surface part needs the space for connection between a lead terminal and an electrode side terminal area. When space is generated between a unit-cell end face and a sheathing case inside by this space for connection and a strong impact and vibration are received, a unit cell moves in the inside of this space. Migration of this unit cell became a cause and the big problem for this cell that expansion and contraction and bending stress worked in the weld zone of a lead terminal and an electrode side terminal area or the lead drawer section near the weld zone, and a lead terminal was cut arose.

[0005] The main purpose of this invention is to cancel the aforementioned stress and prevent cutting of a lead terminal according to the expansion and contraction or

deformation of the letter bending section of the abbreviation for S characters prepared in the lead terminal, even when a unit cell moves in response to an impact and vibration with a strong cell in the space within a sheathing case.

[0006]

[Means for Solving the Problem] This invention for attaining the above-mentioned purpose the flat unit cell which carried out the laminating unification of the separator and negative electrode which consist of a polymer to which each holds the positive electrode of the shape of the shape of a film, and a sheet, and an electrolyte, or this The number pile \*\*\*\*\* of arbitration, In the cell which consists of a sheathing case which consisted of lamination sheets of the resin film subject who sealed this unit cell or a cell group inside An end is welded to the part which the terminal area of the positive electrode of each unit cell which constitutes the terminal area of the positive electrode of a unit cell and each negative electrode or a cell group, and each negative electrode piled up with the same polarities. The letter bending section of the abbreviation for S characters which stood in a row at the welding side end, and was turned up in the direction of the electrode terminal area root, and was again turned up in the direction of a drawer of a lead near the terminal area root by each lead terminal of positive/negative with which the other end was pulled out out of the sheathing case is formed.

[0007] Moreover, this lead terminal welds an end to the first page side of any upper and lower sides of the terminal area of a positive electrode and each negative electrode. The 1st bending section which stood in a row in this, crossed the terminal area end face, and was turned up towards the direction of the terminal area root at the whole surface side of a terminal area which was bent on the other hand at the side, or was welded near the terminal area, If the letter bending section of the abbreviation for S characters which consists of the 2nd bending section again turned up towards the direction of a drawer of a lead near the terminal area root is prepared, the stress which originates in migration of a unit cell and joins the lead section Expansion and contraction and deformation of the letter bending section of the abbreviation for S characters are solved promptly, and cutting of a lead terminal can be prevented good.

[0008]

[Embodiment of the Invention] Hereafter, an accompanying drawing explains the example applied to the polymer electrolyte cell as an operation gestalt of this invention.

[0009] Laminating unification is carried out through the separator 3 of the shape of a film which becomes the both sides of the negative electrode 2 of the shape of the shape of a film which plastered both sides of same porous thin charge collector 2a with the active material paste for the positive electrode 1 of the shape of the shape of a film which plastered one side of porous thin charge collector 1a with the active material paste, and prepared active material layer 1b, and a sheet, and prepared active material layer 2b, and a sheet from the polymer holding an electrolyte, and the flat unit cell 4 is

constituted. in order to obtain a required cell capacity -- this unit cell -- the number of arbitration -- for example, 4-6 pieces are accumulated and it considers as a cell group. A unit cell or a cell group is held in the saccate sheathing case 7 which finally consists of a resin film subject's lamination sheets, and is sealed. Terminal area 1c of the positive electrode of two sheets of a unit cell is in the piled-up condition, terminal area 2c of the negative electrode of one sheet remains as it is, and the end of the lead terminals 8 and 9 of forward [ which consists of sheet metal there ], and a negative electrode is welded, respectively.

[0010] As shown in the top view of drawing 1 , the rectangle-like lamination sheet was beforehand folded in half with the center line T of the die-length direction, and the up-and-down side edge sections P1 and P2 have welded or pasted up the saccate sheathing case 7. And in the condition that the edge P3 is open, a unit cell is inserted in the interior, where a part for the point of the lead terminals 8 and 9 by which the part was surrounded with the films 5 and 6 for seals is pulled out out of a case, heat joining of the edge P3 part is carried out, and a case is sealed.

[0011] The seal structure of the edge P3 of the lead drawer section of this unit cell and the saccate sheathing case 7 is constituted as shown in drawing 2 which is the sectional view of drawing 1 .

[0012] In drawing 2 , the flat unit cell 4 which carried out the laminating unification of the positive electrode 1 of the shape of the shape of a film and a sheet by thermal melting arrival through the separator 3 is sealed by the saccate sheathing case 7 at the both sides of the negative electrode 2 of the shape of the shape of a film, and a sheet. Of course, the electrode group which accumulated two or more unit cells may be sealed.

[0013] Porous positive-electrode charge collector 1a consists of a punching metal or lath metal made from aluminium foil, and the conductive paint film which consists of mixture of carbon powder, such as acetylene black and KETCHIEN black, and binders, such as polyvinylidene fluoride, is formed in the front face. Moreover, negative-electrode charge collector 2a consists of a punching metal or lath metal made from copper foil, and the same conductive paint film as said positive-electrode charge collector 1a is formed in the front face.

[0014] As shown in drawing 1 , in each of charge collector 1a of the positive electrode 1 of two sheets which constitutes a unit cell, terminal area 1c for connecting the positive-electrode lead terminal 8 extends rightward, and is formed in the location which the right-hand side edge biased (drawing above) at it. Extension formation of the terminal area 2c for connecting the negative-electrode lead terminal 9 to the location biased also to charge collector 2a of a negative electrode 2 down [ of the right-hand side edge ] is carried out rightward.

[0015] the end of the negative-electrode lead terminal 9 by which the end of the positive-electrode lead terminal 8 formed in this positive-electrode side terminal area 1c with aluminum sheet metal with thick thickness rather than charge collector 1a was

formed also in negative-electrode side terminal area 2c with copper sheet metal with thick thickness rather than charge collector 2a -- respectively -- the welding point S -- resistance welding -- or ultrasonic welding is carried out.

[0016] The positive-electrode lead terminal 8 (the same is said of negative-electrode lead terminal 9) The end 10 piled up and welded to the terminal area 1c bottom piled up two sheets as it expanded to drawing 3 and was shown, The 1st bending section 11 which was bent at the terminal area 1c end-face side which stood in a row in this and the above piled up, and was turned up in the direction of the terminal area root along with the terminal area inferior-surface-of-tongue side, It consists of the bending section of the letter of the abbreviation for S characters which consists of the 2nd bending section 12 again turned up in the direction of a lead cash drawer near the terminal area root section, and the lead section 13 which stood in a row in this bending section, was extended and came out of toward the edge P3 and which the tip projected out of the case. The bending section of the letter of the abbreviation for S characters for these impact absorptions is suitable to prepare in the lead cash-drawer space within the case restrained in volume, without occupying only few volume and enlarging a cell dimensionally.

[0017] As shown in drawing 1 and drawing 2 , after the saccate sheathing case 7 folds in half the lamination sheet 14 formed in the shape of a rectangle in a central bend line T part, carries out heat welding of superposition and the parallel side edges P1 and P2, makes principal planes 15 and 16 saccate, holds a unit cell in the interior and finishes the drawer of a lead terminal, it carries out heat welding of the edge P3 at the last.

[0018] When an impact and vibration are added to a unit cell, as for the principal plane of a case, the flat-surface section of the unit cell which countered with this by side edges P1 and P2, and the long side edge section, the migration is controlled a passage clear from the top view of drawing 1 . The migration of a unit cell on left-hand side from here is also stopped by central bend line T of a sheet. The space for lead terminal drawers is between the edge P3 of a case, and the terminal area of a unit cell, and a unit cell moves this space part to the right from the left.

[0019] At this time, the stress which joins the weld zone S and the lead section 13 of a cell terminal area and a lead terminal end is canceled by deforming so that the 2nd bending section 12 of the letter bending section of the abbreviation for S characters may involve in the lead section 13 and may extend the S character-like section for a long time. Moreover, the stress received in case a unit cell moves to the left from the right conversely is consumed as deformation force at the time of the S character-like section prolonged for a long time returning to the original die length, and neither the welding exfoliation by the stress concentration to a weld zone S nor cutting of the lead section is produced. In addition, the lamination sheet 14 allots metallic foils, such as aluminium foil, in the center, and can use what laminated the resin film of thermal melting arrival nature, and the resin film which was excellent at the mechanical strength for the both

sides. As these film formation resin, it is independent or polypropylene, denaturation polypropylene, polyethylene, denaturation polyethylene, polyethylene terephthalate, thermal melting arrival nature polyimide, a polymethyl methacrylate, etc. can be used as two or more sorts of these copolymerization resin.

[0020] Gas barrier nature and protection-from-light nature of the lamination sheet containing such a metal layer improve by the metallic foil, and the closure can be easily performed by heat joining of thermal melting arrival nature resin films.

[0021]

[Example] Next, the example of the flat cell of this invention is explained.

[0022] The unit cell by which the end of the positive-electrode lead terminal 8 which had the letter bending section of the abbreviation for S characters in positive-electrode side terminal area 1c and negative-electrode side terminal area 2c, respectively as it describes above and was shown in drawing 1 , and the negative-electrode lead terminal 9 was welded to the condition of drawing 3 After being inserted in the interior of a case from the opening part of a saccate sheathing case and pouring in the electrolytic solution of the specified quantity, carrying out heat welding of the edge P3 which was carrying out opening are consisted of by the flat cell with 30mm of \*\*\*\*, 60mm [ of horizontal abbreviation ], and a thickness of about 4mm.

[0023] Forward and the negative-electrode lead terminals 8 and 9 are all thicker than the thickness of the electrode side terminal areas 1c and 2c, for example, the lead terminal 9 made from copper sheet metal is formed for the lead terminal 8 made from aluminum sheet metal in 80 micrometers at 80 micrometers to the thickness of 50 micrometers of copper negative-electrode terminal area 2c to the thickness of 40 micrometers of positive-electrode terminal area 1 made from aluminum c, respectively. It is effective, if thickness of a lead terminal is thickened when ensuring support of the electrode side terminal area welded to the end, and when securing the endurance over expansion and contraction of the letter bending section of the abbreviation for S characters. In addition, the letter bending section with a die length of about 2mm of the abbreviation for S characters was prepared in the lead section which attended the lead cash-drawer space of 6mm of \*\*\*\*. This flat cell is set to A.

[0024] The cell which changed forward and the negative-electrode lead terminals 8 and 9 was set to B so that it might expand to drawing 4 and might be shown. The end 10 which puts the lead terminal of this cell on the terminal areac [ 1 ] and 2c bottom which the plate piled up, and is welded, The 1st bending section 11 bent so that it might stand in a row in this and might be reversed in the direction of the terminal area root by part for a terminal area point, The bending section of the letter of the abbreviation for S characters which consists of the 2nd bending section 12 turned up so that it might be reversed in the direction of a lead cash drawer again elongation and near the root section in the direction of the terminal area root along a terminal area top face, It consists of the lead sections 13 which stood in a row in this bending section, were extended and came



out of toward the edge P3 and which the tip projected out of the case.

[0025] although not illustrated -- forward and the negative-electrode lead terminals 8 and 9 -- the plate-like lead terminal which does not have the letter bending section of the abbreviation for S characters in each was prepared, and the cell welded to the terminal area bottom on which the plate put the end in piles was set to C.

[0026] Every 20 cells A, B, and C each of these were prepared, the drop test was performed in the condition of having held in the sheathing case made of resin of the same predetermined size, respectively, and cutting for a lead terminal area by the impact and vibration and welding exfoliation were investigated. The contents of a trial investigated open cell voltage for this every [ 50 cycle repeat and ] 10 cycle by making to drop a cell on a concrete side from height of 30cm, respectively in the 6th page condition of vertical front and rear, right and left into 1 cycle.

[0027] Consequently, Cells A and B showed open cell voltage equivalent to trial before also after 50 cycle progress, and did not produce cutting for a lead terminal area by the impact and vibration, and welding exfoliation. On the other hand, the abnormalities in an electrical potential difference were looked at by ten pieces among 20 pieces at the 20 cycle time, and, as for Cell C, the abnormalities in an electrical potential difference were looked at by 20-piece total at the 30 cycle time. When Cell C was disassembled and investigated, any cell was disconnected near the part by which the seal was carried out by the case edge near the weld zone of a lead terminal by the metal fatigue by deformation hauling.

[0028]

[Effect of the Invention] As the above explanation, by this invention, the letter bending section of the abbreviation for S characters is prepared in the lead terminal with which the end was welded to forward and a negative-electrode terminal area, respectively, the absorption dissolution of the migration stress which joins a cell according to expansion-and-contraction deformation of this part at the time of a fall impact can be carried out, cutting of a lead terminal can be lost, and a reliable flat cell can be offered.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The top view showing the configuration of the flat cell in the operation

gestalt of this invention

[Drawing 2] The sectional view of this cell

[Drawing 3] The expanded sectional view in which attaching in with the structure of a lead terminal and showing a condition

[Drawing 4] The expanded sectional view in which attaching in with the structure of another lead terminal, and showing a condition

[Description of Notations]

1 Positive Electrode

2 Negative Electrode

3 Separator

4 Unit Cell

7 Sheathing Case

8 Positive-Electrode Lead Terminal

9 Negative-Electrode Lead Terminal

10 End of Lead

11 1st Bending Section

12 2nd Bending Section